

indicates that there is no necessity for the application of a mechanical facing-point lock separate from the switch stand on facing point switches in automatic block-signal and train-control

territory. However, it is essential that the throw rod be forged from one piece of metal, i.e., the rod should be one continuous piece without a weld.



## Inspecting Switch Circuit Controllers

*"On main-line automatic-block signal territory, how frequently should switch circuit controllers, connections, and the circuits affected, be tested and inspected?"*

### Monthly Report Made

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On the Burlington, switch boxes are inspected thoroughly and all necessary adjustments made during the last week of each month. At the end of the month a report is rendered to the effect that "all switch boxes have been inspected and adjustments are correct." The fact that "all fouling sections have been tested and are o.k." is reported at the same time.

Maintenance men make inspections of operating rods, fittings, etc., each time they are around a switch between these detail monthly inspection periods.

### Inspect Every 30 Days

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Assuming that the track in the immediate vicinity of a switch is reasonably well maintained, it is my opinion that a switch circuit controller in automatic signal territory should be inspected and readjusted, if necessary, at least once every 30 days. Of course, proper track maintenance includes consideration of alinement, surfacing, gage, rail creepage, condition of switch points, braces and plates, etc.

The performance of switch circuit controllers and circuits in continuous train-control territory, where the circuits are so installed that the opening of a contact will remove train-control energy from the track section in which the switch is located, clearly demonstrates that not infrequently switch points will open under a train sufficiently to cause a circuit interruption.

For other answers to this question see page 442 of the August issue.

However, when carrying no load, the points seem to be in proper and safe condition. Unquestionably, such opening, if occurring during a facing-point movement, might result in serious consequences.

The same condition with respect to opening under passing trains will exist in non-train-control territory, but it may not so readily be brought to light by reason of the difference in the functioning of the circuits. An inspection at least once each 30 days is necessary in order that such improper condition of switches or switch circuit controllers might be discovered and proper corrective measures initiated.

### How to Avoid Switch Troubles

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The best way to avoid troubles resulting from switch circuit controllers being out of adjustment is to make weekly inspections of all switches. The inspection should include operation of the switch several times so as to detect lost motion in the fittings, examination of the electrical connections, and the maintenance of a 3/16-in. switch-point adjustment of the contacts. At every inspection the fouling circuit at the siding should be tested by shunting at the clearance point. A voltmeter connected across the main track should be used to determine the effectiveness of the shunt. Rails in reasonably good condition, having good bracing and heel blocks at switches, are necessary if signal failures are to be prevented.

Section men should not be allowed to do any track work at main line switches without first notifying the signal maintainer of what is to be done. Such work as raising track, installing new heel blocks, ties or switch connections that may change the gage of the points and track, alining and respiking switches, changing insulation such as that of joints, gage rods or head rods, should not be done except in the presence of the signal

maintainer, who can make proper adjustments after the work is completed. The section men are the signal maintainer's best friends, and close co-operation between the track and signal forces goes far in the elimination of hazardous conditions and train delays.

Of course, the traffic density to a great extent determines the frequency of switch box and fouling inspection. However, accidents have happened in light-traffic territories, as a result of improper or too infrequent inspection of track and signal apparatus.



## Circuit for Flashing Light Signals

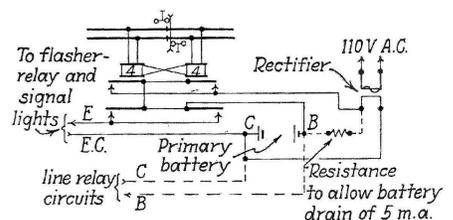
*"What circuit arrangement can be devised for use at flashing-light crossing-signal installations so that, without the use of a power-off relay, the standby primary battery and rectifier are both on a normally-open circuit?"*

### Output Circuits Normally Open

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The accompanying sketch illustrates a simplified circuit arrangement for a flashing-light signal using primary battery for standby power. The rectifier is adjusted to the operated load, the output circuit being run through two pairs of back contacts in the interlocking relay in a parallel-



Details of crossing-signal circuit—Dotted lines show optional variation

series arrangement. The primary battery is connected between the two pairs of relay contacts making the rectifier and the battery operate in parallel, only while the signal is in operation, both being normally on open circuit.

The dotted lines refer to a second-

Note: For another answer on this subject see page 380 of the July issue.

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ary circuit which may be desirable. This circuit derives part of its energy continuously from the battery, depending on the adjustment of the resistor between the rectifier and the battery. This resistor can be adjusted to compensate for the load imposed

by the normally-energized circuit, shown dotted, but allowing a 5 m.a. drain on the battery. The application of the rectifier output to the operating load can be adapted to any type of crossing-signal circuit arrangement.

## Avoiding Light-Out Signal Failures

*"What methods are used to safeguard light-out failures in color-light signals, caused by a broken filament in the normal-burning light? Please answer for searchlight type signals having but one lamp and for multiple-unit color-light signals."*

### Light-Out Relays Utilized

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In addition to the careful observance of manufacturers' recommendations concerning the proper handling, testing and voltage adjustment to prevent failures of electric lamps used in color-light signals, two different methods are used to safeguard light-out failures on such signals:

Where multiple unit color-light signals with single-filament lamps are used as automatic block signals governing movements at speed, a light-out relay is placed in series with the filament of the normally-burning light, generally the green light (Proceed indication). In case of a burn-out of the filament, the light-out relay becomes de-energized and transfers the light indication to the yellow or "approach" signal unit. Where the yellow or approach indication is the indication normally displayed by the signal the greater proportion of time, an auxiliary light unit displaying the yellow approach indication is provided as a reserve. This light-out arrangement is not provided for in dwarf or slow-speed signals, nor on interlocking signals having two or more lights normally burning red. The circuit arrangements are shown in Fig. 1a and 1b.

Where searchlight type signals with double-filament lamps are used, the high-wattage filament is in multiple with a low-wattage filament, and this in itself provides considerable protection against light-out failures. However, in order that an additional safe-

guard might be secured, it is the practice on the North Western to place a light-out relay in series with these

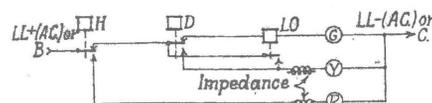


Fig. 1a Circuit for color light signal where the Yellow indication is used as a reserve for the Green.

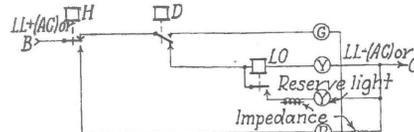


Fig. 1b Typical circuit for color light signal with a reserve Yellow light unit for use where the signal normally indicates Yellow.

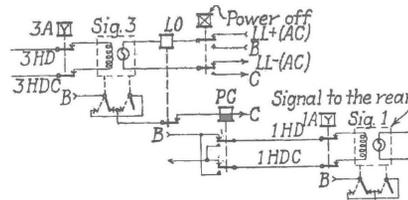


Fig. 2 Typical circuit for searchlight type signal.

### Lighting circuits in use on the North Western

filaments, this light-out relay having a drop-away high enough to insure that when the high-wattage filament burns out, the light-out relay will drop. This light-out relay controls the circuit of the next signal to the rear in such a manner that when it is de-energized an "approach" indication is displayed by the signal to the rear, thereby regulating the approach of a train up to the signal that has the light out, or the light with only the low-wattage filament burning. This circuit is shown in Fig. 2.

THE NUMBER OF PERSONS killed at highway grade crossings in the month of May, as reported by the Association of American Railroads, was 108, as compared with 140 in May, 1934; injured, 297, as compared with 303.

## Accident Report

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According to the record the C.R.I. & P. train covered the distance from Mediapolis to the crossing, 7.3 miles, in 10 minutes, or at an average speed of 43.8 m.p.h., while the M. & St.L. train covered the distance from Monmouth to the crossing, 41.6 miles, in 1 hour and 50 minutes, or at an average speed of 22.7 m.p.h. Furthermore, Engineman Herman of the C.R.I. & P. train said that his train had not yet reached the C.R.I. & P. distant signal when he first saw the M. & St.L. freight train, and that it looked as though that train was then coming out of a dip; the dip in the M. & St.L. track is located about 500 ft. west of the M. & St.L. distant signal, and, therefore, according to this statement also, the M. & St.L. freight train was the first train to enter the limits of the automatic electric interlocking plant. The foregoing corroborates evidence given by six members of the M. & St.L. train crew, all of whom stated that the home signal governing movement of their train displayed a clear indication.

While Engineman Herman and Fireman DeFore, of the C.R.I. & P. train, both stated that the C.R.I. & P. home signal displayed a proceed indication for their train, there was no other evidence to that effect. The engineman said that the light went to green when his train passed the distant signal, and he called the indication which the fireman acknowledged, although the fireman said he did not see the signal until the front end of the engine was only a short distance from it.

The destruction of some of the signal apparatus as a result of the collision made it impossible to re-establish the operation of the plant at the time of the accident, and, therefore, a positive conclusion cannot be reached. However, the test of the undamaged apparatus disclosed that it was in proper operating condition, and this fact together with the fact that the M. & St.L. home signal cleared properly for the approaching train, and the record of proper operation of the plant since its installation, supports the opinion that the C.R.I. & P. home signal was displaying a stop indication which was not properly observed or obeyed.

### Conclusion

It is believed that this accident was caused by failure of Engineman Herman of C.R.I. & P. Train No. 63 properly to observe and obey a signal indication governing the movement of his train over a railroad crossing.